



Expert Insights

Safety Management Systems and Bowties

How Safety Management Systems and Bowties can Enhance and Optimize Risk Management Strategies

Summary

Navigating the multitude of software options and methodologies to manage your risk landscape can be daunting. In the complex and dynamic aviation industry, where risk and safety are integral to company strategies, this challenge is even more pronounced.

To explore how Safety Management Systems and the Bowtie methodology can enhance and optimize risk management strategies, we invited Gerald Kosbab from [AeroDirections](#) to share his expertise. Read his insights now!

About us

Bowtie Suite is the leading provider of barrier-based risk management solutions. It's an off-the-shelf, intuitive, risk management software solution that support your organization during every step of your safety journey to enable safe and efficient operations.

Expert Profile

Gerald Kosbab is the founder of AeroDirections, LLC in Plano, Texas. His background includes a mix of over 40 years in aviation, information technology, and consulting. In the aviation world, he holds commercial pilot, flight instructor, and aircraft mechanic's certificates and has worked in engineering, aircraft flight test, and certification. He also spent 20 years in information technology-related businesses, primarily supporting major aerospace and defense companies through systems integration and consulting. AeroDirections was founded 10 years ago and provides safety, quality, risk, and compliance management services predominately in the aviation, aerospace, and government markets in the Americas. This work includes being a Wolters Kluwer Enablon Bowtie Suite partner as well as providing aviation safety consulting, training, and auditing services.

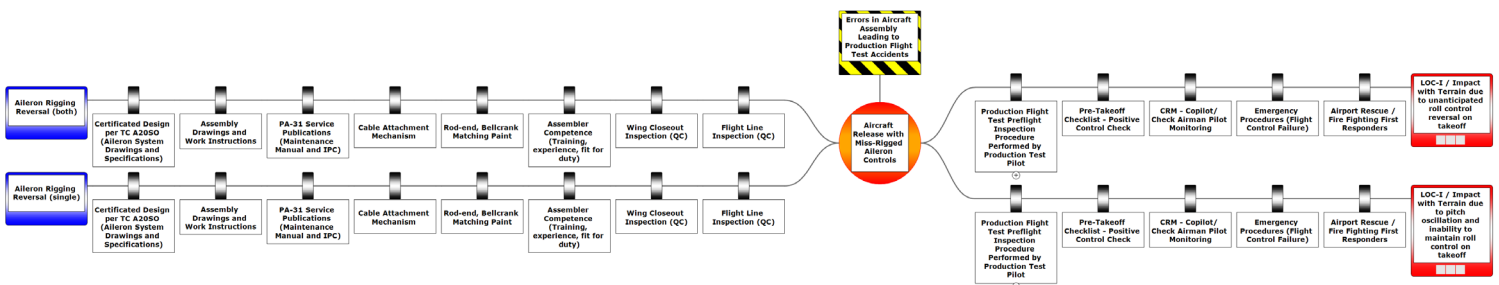
What is a bowtie?

Bowtie refers to both a barrier-based risk management methodology and to the diagrams used for analyzing and assessing risk. A bowtie diagram visualizes the risk you are dealing with in one understandable picture. It is shaped like a bowtie, creating a clear differentiation between the proactive and reactive side of risk management. In the Bowtie Suite, the bowtie diagram provides you with an overview of multiple plausible causal scenarios and shows what barriers you have in place to control these scenarios. Bowties are maintained so they always represent the current status of your safety barriers.

The barriers¹ in the bowtie diagram show what controls you have in place to prevent, mitigate, or eliminate major consequences from happening. Making people responsible for barriers makes transparent what everybody is supposed to do to operate safely. When operational staff is involved in the development of a bowtie, accurate operational information is included. Furthermore, it ensures that staff will take ownership in managing risk.

(Click on the image below to see the bowtie in full)

Bowtie Suite provides the ability to visualize how you manage the risks associated with your operational hazard on easily understood diagrams. Each activity can be traced back to the barrier it is supporting. Displaying all data on the bowtie enables everyone to see the complete risk context, together with the activities they are responsible for. Managing and monitoring risk is a core requirement of an SMS.



What is a Safety Management System?

Safety management systems (SMS) are based on international standards and recommended practices published by the International Civil Aviation Organization (ICAO), a United Nations' agency. ICAO Annex 19 sets the worldwide standard for SMS, for their 193 member countries. They agree to develop regulations based on those standards.

SMS is based on four components:

- **Safety Policy:** The organization's commitment to safety and sets the framework for all safety-related activities. The safety policy outlines the company's approach to managing safety risks and maintaining a safe operational environment.
- **Safety risk management:** The design of your processes to ensure safe operations by identifying potential hazards, and implementing measures to mitigate associated risks to an acceptable level.
- **Safety assurance:** The performance management to ensure the SMS is effective through continuous monitoring, evaluating, and improving safety performance. Safety assurance ensures that safety measures and processes are effectively implemented and achieve the desired safety outcomes. This is where most organizations spend their time: managing their audit programs, reporting programs, and analyzing all the safety data they collect.
- **Safety Promotion:** The safety training and communication requirements of the SMS.



¹ Note that throughout this document, controls and barriers are used interchangeably.



Harmonious collaboration



Gerald Kosbab, Founder of AeroDirections and an expert in the Aviation Industry, shared with us his perspectives on how complementary SMS and Bowties can be. Here are his insights on the matter.

The SMS tools that I have worked with, have varying levels of risk management capabilities. Some of them are quite good but often lack the visualization provided by bowties.

So while they are effective at reinforcing a process, they lack the ability to be used effectively, in particular for the training and communication facets of operational risk. This is where the benefits of bowties come into play and provide an effective solution for these aspects.

Indeed, referring to the above definition of an SMS, the 4th component of the safety management system is training and promotion. This crucial part of an organization can be significantly streamlined thanks to the visual aspect of bowties.

However, this aspect extends beyond training and communication. Its visualization is fundamental to Safety Risk Management; with its design process

aimed at managing risk and facilitating risk-based decision-making.

When implementing these systems, I often encountered a lack of a formalized process for managing risk within them. That's where a lot of times people just said, "Well, there's a risk matrix there. We'll pick a number that we think is right and that's as far as we go". Yet, this approach does not provide a fully integrated and optimized process and leads to a loss of insights due to a lack of visualization.

Nevertheless, if you combine the visualization you get from a bowtie with the workflow processes implemented in your SMS, you get the best of both worlds. Change is integral to the safety risk management process within a SMS. Incorporating bowties into your process enables an effective risk-based management of change.

Change: an integral part of SMS

Safety Risk Management (SRM) and Safety Assurance (SA) form the two core operational processes in an SMS. The SRM process should be undertaken whenever new hazards are identified, if you are altering processes and procedures, or if your audits and safety assurance processes reveal ineffective risk controls. Following the ISO 31000 Risk Management framework helps ensure that your process design addresses any systemic issues that may emerge as a result of these changes.

The data derived from the SA processes provide valuable feedback into bowties, assisting with understanding the effectiveness of barriers. The design phase, where we actually build the bowtie, supports the analysis and assessment of risks. Thus, the bowtie serves as a crucial link between these two core processes, playing a vital role in any safety management system that adheres to ICAO standards, globally. Because, at the end of the day, the question is if we're not working with something visual, how do we identify the gaps? It's not as much about what is there but about what is missing!

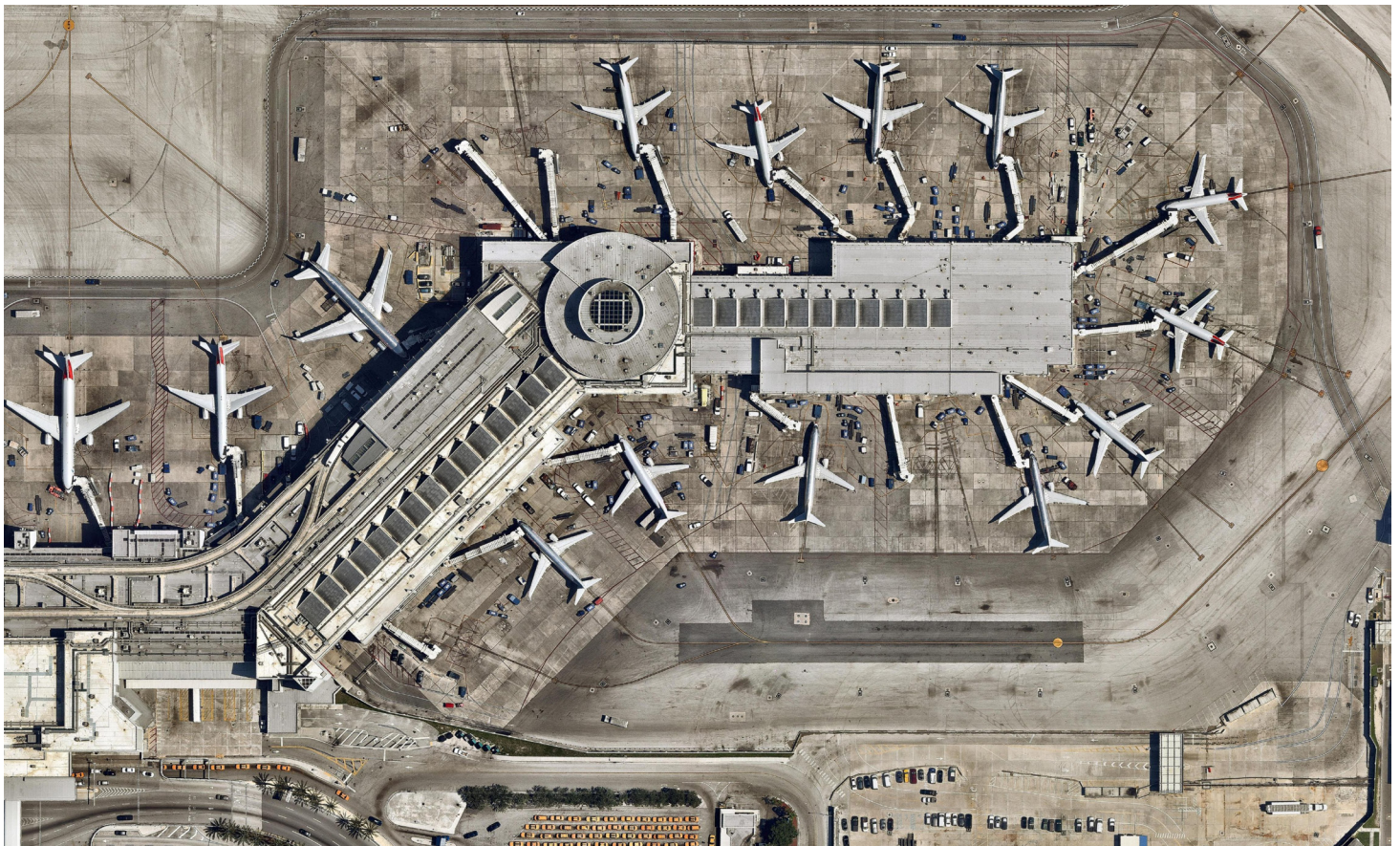
For instance, if we observe that the threats on the right side of a bowtie diagram are all addressed solely by different sections of a procedures manual, it implies that the only controls in place are administrative ones. This raises a concern: how can we be sure that these controls are dependable and effective?

This realization is what can be captured through the visualization provided by bowtie, along with the data associated with our controls in a bowtie model. I think THAT is the undervalued piece: People will look at it and say "Great, I can create the visualization and I'll turn on or off the effectiveness values. And yeah, there's all this other stuff I can do, but I don't really understand what I should use that for?" However, you can only truly appreciate the value of your data when you start viewing your bowties as a visual interface to a database. The various attributes that can be assigned to a bowtie's barriers are critical elements for risk managers who are advancing their business intelligence capabilities.



"If we're not working with something visual, how do we identify the gaps? It's not about what is there but about what is missing!"

Gerald Kosbab
Founder
AeroDirections



Optimizing your Business Intelligence Systems via Bowtie Suite

Business Intelligence (BI) software is being deployed by many organizations to better analyze and display their safety data and these tools generally access this data through Application Program Interfaces (APIs). In BowTieXP Enterprise for example, you can easily link to the extensive risk-related data contained in the bowties using the same business intelligence systems that you already use to gather and display your safety insights.

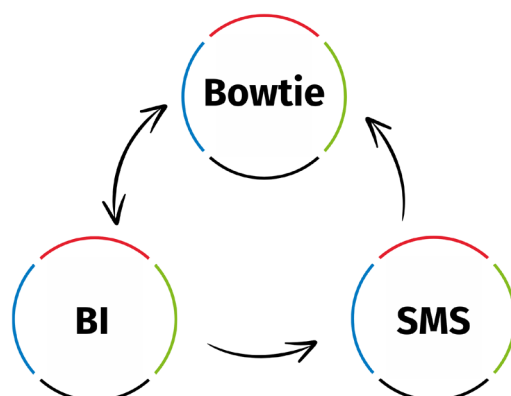
Usually, the airlines and other organizations that AeroDirections are working with have very extensive BI implementations using

tools such as Tableau or Microsoft PowerBI. These systems have incredible power, but if you don't have data to feed it, it's worthless.

Most companies focus on data from their SMS or quality management systems. However, they lack the in-depth risk data found in bowties. They need the database capabilities behind the bowtie to support the comprehensive view they seek in their business intelligence.

The importance of information feedback flow

The ultimate goal is to establish a continuous feedback loop where data flows in both directions: from the SMS to Bowtie Suite, into Business Intelligence, and back into the SMS. This represents the next level of maturity.



Currently, we are primarily in the data extraction phase with most companies. To advance, companies have to realize the importance of integrating this information flow. When they receive data from their reporting systems or audit systems, it should feed into their bowties for optimal efficiency. This enables tagging data against controls that have failed or underperformed.

This two-way communication enhances bowtie value, allowing companies to move beyond manual data entry, gain time, and focus on interpretation. This means quickly identifying which controls were involved in incidents and highlighting reduced effectiveness based on incoming data.



Balanced risk overview for the whole aviation system

The effectiveness of your controls is critical, but keeping up with all of the controls in a large organization can be very labor-intensive. Without up-to-date data, the impact of your barrier management process might indicate that you are still in control when maybe you are not. Applying automation assists you to make those changes on time.

I think that's the driver for companies to begin looking at the bidirectional exchange of information between the transactional systems and the risk management system. This will enhance their confidence in the insights provided by bowties regarding risk. It will also refine their assurance processes, enhancing what they measure,

evaluate, review, and audit, based on the insights gained from risk management. So, it becomes a continuous loop there as well, not just inside of the SMS but in the broader context of managing risk across these multiple systems, when that exists.

Ultimately, the greater the risk, the more imperative it is to manage it, as higher risks can lead to more severe consequences. Identifying these risks is crucial. By integrating your existing systems to enhance their efficiency, you can significantly improve your decision-making process and ensure the safety of your operations.

Contact us to see how these insights can be applied to your organization.

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[Request a demo](#)



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